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ABSTRACT

Nonpoint sources of pollution have diffuse origins and are major contributors to water quality problems in both urban and rural areas. Addressed in this instructor's manual are the identification, assessment, and management of nonpoint source pollutants resulting from mining, agriculture, and forestry. The unit, part of the Working for Clean Water Project, is designed for citizen advisory groups interested in water quality planning. Also available is a supplementary audiovisual program. (Author/WB)

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Working for Clean Water

An Information Program for Advisory Groups

Nonpoint Source Pollution

Agriculture, Forestry, and Mining

Instructor Guide

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION

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SE 035 460

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This project is dedicated to the memory of Susan A. Cole.

Nonpoint Source Pollution: Agriculture, Forestry, and Mining

Pollution sources are either at readily discernible locations, or have diffuse origins that are difficult to pinpoint in a watershed. This latter type of source, called a *nonpoint* source of pollution, is a major contribution to water quality problems in both urban and rural areas. Although in the past point sources received the most attention by 201 and 208 planners, nonpoint source pollutants today often dominate the water quality decisions in both urban and rural areas.

Nonpoint source pollutants are generated by various kinds of activities, including agriculture, construction, mining, septic systems, silviculture, and urban activities. Because of the broad scope, this unit of instruction is limited to the major rural sources — agriculture, mining, and silviculture or forestry.

At the end of this presentation the participant should be able to:

- Define a nonpoint source pollutant
- Have a feel for the planning sequence and its problems
- Know how nonpoint sources are identified and assessed
- Know what Best Management Practices (BMPs) are and their general approaches
- Consider technical and financial assistance opportunities
- Begin identifying management agencies and regulatory programs for implementing a plan.

Required Materials

☐ Set of slides and cassette tape for the audiovisual presentation, "Rural Nonpoint Sources of Pollution"

☐ Slide projector, screen, tape player, and related equipment

☐ Set of flip charts with easel and/or transparencies with overhead projector for guided discussion

Continued on next page

☐Good, clear topographical map of the local area

☐Copy of the handbook, "Nonpoint Source Pollution: Agriculture, Forestry, and Mining" for each participant.

Important Notes

1. The heart of this instructional exercise is a case study. Either the Montana study or one for the local area may be used. Mailing it to the participants in advance of the session will gain time for the guided discussion.

2. A copy of the comments sheet in the Appendix of this guide should be prepared for each participant.

3. Advance preparation is recommended if the instructor is not knowledgeable in the following areas:

- Problems, programs, and trends of the local area dealing with nonpoint source pollutants or related subjects (e.g., stormwater management). Discussions with the U.S. EPA, state, and county personnel may be helpful.

- Technical aspects of Best Management Practices and certain concerns and principles, such as the premises of computational procedures like the loadograph model, the Universal Soils Loss equation, and the Soils Cover Complex and Rational Methods for stormwater runoff. The instructor doesn't have to master these techniques, but should be familiar with their makeup, benefits, and drawbacks. The selected references provide background material on these procedures.

The instructor may wish to have present technical experts for a backup.

4. If possible, a Best Management Practices field trip should follow the session. Existing problems and successful and unsuccessful control efforts should be featured. This option is especially feasible concerning stormwater management and erosion control.

5. Since storm events have an important role in nonpoint source problems of both urban and rural areas, it is strongly suggested that the instructor be familiar with the materials in the handbook, "Urban Runoff."

6. The audiovisual presentation script and/or the slide-tape program should be previewed for items of local concern that may warrant discussion.

Suggested Activities

Introductory Comments	5 minutes
Audiovisual Presentation	15 minutes
Guided Discussion	35 minutes
Closing Questions and Answers	5 minutes
TOTAL TIME	60 minutes

Introductory Comments (5 minutes)

1. Prior to the presentation, post a large "Nonpoint Sources of Pollution" sign in a conspicuous location.

2. Open with several choice quotations or statistics about nonpoint source pollution to generate interest in the topic.

Use citizen handbook or other source.

3. Briefly review the objectives of this session and use the quotations or statistics as justification for them.

List objectives on transparency or flip chart.

Audiovisual Presentation (15 minutes)

1. The presentation is concerned with the rural aspects of nonpoint source pollution and therefore focuses upon agriculture, mining, and forestry.

Script is in Appendix in case of equipment malfunction.

2. Advise the participants to jot down any comments or questions for later discussion.

Guided Discussion (35 minutes)

1. Either respond now to the questions about the audiovisual presentation, or reserve them for an appropriate time later.

2. List several examples of point sources and of nonpoint sources of pollution. By discussing the differences and similarities of the sources of pollution, develop a working definition for nonpoint source pollution.

3. Test the definition by classifying the following as to point source (PS) or nonpoint sources (NPS) of pollution:

Answers	
NPS	Septic system
PS	Log sorting yard
NPS	Farm field
NPS	Abandoned coal mine
PS	Electroplating firm lagoon

Important distinction to make.

4. Note that the same type of pollutant — acid — comes from the last two examples. Use this to emphasize that it is the origin of the pollution, not the type of pollutant, that is important. The same pollutant may emanate from both point and nonpoint sources.

Use chart 1 on Nonpoint Source Pollutants.

5. Discuss the locations and magnitude of the major types of nonpoint source problems in the local area. Compare them to nonpoint source problems elsewhere.

Use chart 2 on Nonpoint Source Pollution Planning.

6. Briefly discuss the six-stage planning sequence.

Take time to discuss "allowable pollution load." Background information may be needed on water uses, criteria, and standards. Also, introduce the concept of "assimilative capacity," since allowable loads are based upon the premise that streams have capacities to break down various amounts of most pollutants.

7. Discuss citizen input into the planning process in the context of a CASE STUDY and the local situation.

8. If the Montana study is used, allow the participants to read it. Briefly recap it before beginning a discussion.

Use handout 1 on Case Study Comments.

9. Distribute a copy of the case study comments sheet to each participant.

If the case study on Montana is not used, continue discussion with item no. 10 on page 8.

ANALYSIS OF THE CASE STUDY ON LEWIS AND CLARK COUNTY, MONTANA

What was the water quality planning goal in Montana?

Erosion and sedimentation control

. . . in the local area?

The relationships among pollutants, transport, and allowable pollution loads are technical matters largely handled by governmental agencies. These concerns, however, have a bearing upon the choice of BMPs — one of the activities of the Montana citizen advisory group.

What technical assistance was available in Montana?

A three-person staff

Other possible technical sources?

Soil Conservation Service and the Conservation District
Forest Service
Bureau of Land Management
State agencies

. . . in the local area?

What was involved in identifying BMPs? Why was it done?

BMPs were to be part of the ordinance. These groups also studied: information/education and financing/cost effectiveness. BMPs were dealt with by both state and local advisory groups.

What kinds of problems might be associated with the information and cost-effectiveness aspects?

Source of data
Inadequate data base
Assessment criteria

. . . in the local area?

The next questions concern PLAN FORMULATION AND IMPLEMENTATION

What was the legal basis for forming and implementing a plan?

PL 92-500, the Federal Water Pollution Control Act Amendments of 1972. Also, in Montana the Conservation District, as approved by local referendum, can administer soil and erosion control programs.

. . . in the local area?

What are the financial aspects?

Cooperative governmental - private financing was necessary in Montana. Some potential federal sources included the Agricultural Stabilization and Conservation Service cost sharing, and the loans of the Small Business Administration.

Small appropriations and loans were also available from the state of Montana. At the local level, taxes are the most viable option.

Other possible financial sources at the federal level?

Other federal sources include:
The Soil Conservation Service,
Army Corps of Engineers,
Bureau of Reclamation,
Economic Development Administration, and the
Rural Clean Water Program of U.S. Department of Agriculture.

. . . in the state and local area?

What are the environmental, economic, and social impacts of the plan?

These aspects were addressed somewhat in the consideration of BMPs, but no comprehensive effort was made to identify impacts.

How was the plan implemented?

The sediment control plan was administered through the Conservation District. Water quality monitoring was conducted by state water quality officials. The District Supervisors were empowered to impose fines or issue stop work orders for violations.

Advisory group had a role in education and information prior to referendum. Attitudes of the public were considered important by the advisory group.

Are there problems with this approach?

Possible difficulties include: an inconsistency between optional (farmers) and mandatory (developers) participation by various parties. Also, from a political perspective, the enforcement by District Supervisors may not be viable.

. . . <u>in the local area</u>?

Are there any other problems that apparently were not considered in Montana?

The sediment control ordinance may be negated by problems across adjacent political boundaries. Also, the legal responsibility for the maintenance of BMP control structures may not have been worked out.

What are the concerns <u>in the local area</u>?

10. Discuss general approaches to Best Management Practices (BMPs).

Use charts 3 and 4 Best Management Practices.

Using flip charts or transparencies, briefly discuss and give examples of:

- Structural, nonstructural techniques
- Prevention, abatement
- Regulations, incentives, education

11. If there is sufficient time, discuss the BMPs in agriculture, forestry, and/or mining that are suitable for the local area. Use slides to illustrate suitable BMPs. Slides may be extracted from the slide-tape programs described in the selected resources, or they may be obtained from governmental agencies.

Optional discussion of specific BMPs.

Tables in the selected resources can be used to make charts or transparencies for comparing the pros and cons of the BMPs.

The instructor may lead a brief discussion about which strategies are most appropriate to the local area, and what forms they should take to be most effective.

Closing Questions (5 minutes)

1. Answer any remaining questions.

2. Summarize discussions pertaining to the local situation.

Selected Resources

Amy, Gary, et. al. Water Quality Management Planning for Urban Runoff. Report Number EPA-440/9-75-004. Washington, DC: U.S. Environmental Protection Agency, December 1974. 247 pp.

This manual describes procedures for quantifying nonpoint source problems in an area without extensive data available, and assists planners in preliminary evaluation of cost-effective abatement and control practices. Procedures for several levels of sophistication are prescribed, including the loadograph approach. This publication is available as Order No. 0993A from the U.S. EPA Library Services, Maildrop 35, Research Triangle Park, NC 27711.

Porter, Harry L., Jr. Comprehensive Erosion and Sediment Control Training Program for Engineers, Architects and Planners. Sediment Control Manpower Project. Washington, DC: National Association of Conservation Districts, March 1976. 128 pp.

This small book provides background on principles of erosion and sedimentation control processes, computations for predicting soil losses (Universal Soil Loss Equation), control measures, aspects of an erosion and sedimentation control plan, and implementation in Virginia. The book abounds with comparative graphs, pictures, and tables. It is available from the National Association of Conservation Districts, 1025 Vermont Avenue, Washington, DC 20005

Soil Conservation Service. Urban Hydrology for Small Watersheds. Technical Release Number 55. Washington, DC: U.S. Department of Agriculture, January 1975. 77 pp.

Technical discussion of the Soils Cover Complex approach for computing stormwater runoff. It is available from the U.S. Department of Agriculture, Soil Conservation Service, Division of Engineering, Box 2890, Room 5242, Washington, DC 20013.

Wanielista, Yousef A., et. al. "Nonpoint Source Effects on Water Quality", J. Water Pollution Control Federation. Vol. 49, No. 3, March 1977. pp 442-443.

This article is a useful source of statistics on pollutant loading rates associated with different types of land uses. Your librarian will be able to assist you in obtaining this issue.

Forest Harvest, Residue Treatment, Reforestation and Protection of Water Quality. Washington, DC: U.S. Environmental Protection Agency, April 1976. 273 pp. Order No. 2815A.

Methods and Practices for Controlling Water Pollution from Agricultural Nonpoint Sources. Washington, DC: U.S. Environmental Protection Agency, October 1973. 83 pp. Order No. 2117.

Methods for Identifying and Evaluating the Nature of Nonpoint Sources of Pollutants. Washington, DC: U.S. Environmental Protection Agency, October 1973. 261 pp. Order No. 0002.

Water Quality Management Guidance for Mine-Related Pollution Sources (New, Current, and Abandoned). Washington, DC: U.S. Environmental Protection Agency, December 1977. 198 pp.

These EPA publications are helpful in monitoring and evaluating nonpoint sources of pollution. They give the impacts of various agricultural, silvicultural, and mining activities on water quality. Specific best management practices for control of these pollution sources are described in detail. They may be obtained from the U.S. EPA Library Services, Maildrop 35, Research Triangle Park, NC 27711. Order No. 4301.

Nonpoint Sources of Pollution Fact Sheets. Sheet Numbers 1-6. Washington, DC: U.S. Environmental Protection Agency, November 1978. 6 pp.

These sheets are excellent handout materials for providing an introduction to nonpoint source problems, programs, legislation, best management practices, and citizen action. They may be obtained from the Forms and Publications Center, U.S. Environmental Protection Agency, Maildrop 41,Research Triangle Park, NC 27711.

Audiovisual Materials

Slide-tape presentations on nonpoint source pollution.

Twelve slide trays and tapes cover the introduction to selected nonpoint sources of pollution, agriculture, construction, mining, silviculture, and legal/institutional aspects. Specific areas, especially BMP's are discussed in detail. The programs are long (two or three trays of slides), but technical matters are covered. Policy considerations are minimal. The materials are available from either the regional or national offices of the U.S. Environmental Protection Agency (Water Planning Division).

Appendix

A. Contents of charts for use by the instructor in the suggested activities. These charts may be used to make transparencies or the contents may be copied onto flip charts.

1. Nonpoint Source Pollutants

2. Nonpoint Source Pollution Planning Steps

3. Best Management Practices

B. Handouts for use by the instructor in the guided discussion. Copies will need to be made for each participant.

1. Case Study Comments

C. Copy of the script for the slide-tape program, "Rural Nonpoint Sources of Pollution."

Nonpoint Source Pollutants

Sediment
Nutrients
Acids and Salts
Metals
Toxic Chemicals
Pathogens
Heat

Nonpoint Source Pollution Planning Steps

1. Establish goals
2. Assess relationships
3. Determine pollution loads
4. Select Best Management Practices
5. Develop and implement plan
6. Monitor water quality and revise plan

Best Management Practices

Structural Techniques

Sedimentation basin
Diversion barrier
Holding pond
Drip irrigation system
Toxic chemical facility

Best Management Practices

Nonstructural Techniques

Crop rotation
No-till planting
Disturbed land stabilization
Logging schedule
Vegetation buffer

CASE STUDY COMMENTS

Water Quality Problems _____

Planning Goal _____

Technical Assistance _____

BMPs _____

Information Collection _____
and Analysis Problems _____

Planning Legal Basis _____

Plan Financing _____

Federal Financial Sources _____

State/Local Financial _____
Sources

Economic, Environmental _____
and Social Impacts _____

Plan Implementation _____
Approaches _____

Implementation Problems _____

Other Aspects _____

Rural Nonpoint Sources
of Pollution

Slide Description	Narrative
1. Cassette start slide	(silence)
2. Title: Rural Nonpoint Sources of Pollution	(music)
3. Picture: Discharge pipe	Many of us think of pollution primarily in terms of that which comes from a single source, such as a discharge pipe.
4. Picture: "Point Source Pollution" supered over discharge pipe	This most common type of pollution is called point source pollution.
5. Picture: Farmland	It also may originate from a broad area of land, and may be harder to identify. This nonpoint source pollution may run or wash off the ground or may seep through it.
6. Picture: Construction site	Examples include: erosion from construction sites,
7. Picture: Crop rotation	fertilizers or pesticides washed off crop lands,
8. Picture: Acid mine drainage	or acids leached from mines.
9. Picture: "Nonpoint Source Pollutants" supered over four picture composite	These pollutants may be sediments, nutrients, salts, metals, toxic chemicals, and disease-causing organisms. The full impact and importance of nonpoint source pollution control has only recently been realized.
10. Picture: Man pointing at ground cover	Dr. Drannon Buskirk of the Pennsylvania State University comments: without controlling nonpoint source pollution the national goals of making waters clean enough for fishing and swimming cannot be reached. Much of the problem is due to sediment such as erosion from this gully.

11.	Picture:	Man pointing to stream bank	It is so severe here that the soils have been cut to bedrock. More than 10 feet deep (PAUSE). Hundreds of tons of soils with adsorbed pollutants to cause problems downstream. We must reckon with nonpoint source pollution in order to gain our water quality goals in the coming years.
12.	Picture:	Composite of framland and valley	Nonpoint source pollution presents very special planning problems because the climate, the land characteristics, and the different types of pollution vary throughout the countryside.
13.	Graphic:	Nonpoint Source Pollution Planning, 6 step sequence	For these and other reasons, it is extremely important that agreement is reached on dealing with nonpoint source pollution. A six step planning sequence is suggested.
14.	Graphic:	Nonpoint Source Pollution Planning, 6 step sequence step 1 highlighted	In the first step, water quality goals and standards are set. These efforts form a basis for analysis and decision making.
15.	Graphic:	Nonpoint Source Pollution Planning, 6 step sequence step 2 highlighted	In the second step, we assess relationships between different kinds of pollutants and how they are introduced into the environment.
16.	Graphic:	Nonpoint Source Pollution Planning, 6 step sequence step 3 highlighted	Next, allowable pollution loads are determined by examining water use and the capacity of surface waters to break down wastes. With this information as background
17.	Graphic:	Nonpoint Source Pollution Planning, 6 step sequence step 4 highlighted	Step four becomes a most important step -- the identification of what is called Best Management Practices or (BMPs). Here, the most suitable ways for preventing or controlling nonpoint source pollution are identified.
18.	Graphic:	Nonpoint Source Pollution Planning, 6 step sequence step 5 highlighted	Next, a plan is developed which considers rules and regulations, technical matters, environmental impacts, and financial and administrative aspects such as coordination of different agencies. Once a plan is made, the process is not over. Circumstances change.

19.	Graphic:	Nonpoint Source Pollution Planning, 6 step sequence step 6 highlighted	In the sixth step, ongoing water quality planning continues.
20.	Picture:	Marsh land	Music
21.	Picture:	Muddy clay field	Music
22.	Picture:	Forest scene	Successful planning for nonpoint source pollution requires a good data base.
23.	Picture:	Composite of lab analysis and field sampling	The quality of ground and surface waters, land and soil characteristics, climate variations, and many other kinds of information are necessary.
24.	Graphic:	Nonpoint Source Pollution Planning, Step 2 and 3 highlighted	This data is important to all planning steps, especially in the analysis stages.
25.	Graphic:	Advisory group concerns	The collection and analysis of data thus are at the very heart of the planning process. Throughout these activities, citizen advisory groups should ask: · What will the analyses cost in money and time? · Are existing agencies capable of the studies? · Are they relevant to the local situation? · What are the assumptions of the study approaches. These analysis greatly influence the plans. Different methods give different answers. Which, in turn, can result in vastly different costs.
26.	Graphic:	Nonpoint Source Pollution Planning, Step 4 highlighted	Ways of preventing or stopping nonpoint source pollution are called best management practices. Advisory groups can help in identifying the appropriate BMP for each situation. Advisory groups should be acutely aware of what is best suited to the local area.

27.	Graphic:	Words, Structural vs. Nonstructural	We classify the BMPs into two types: Structural and Nonstructural.
28.	Picture:	Composite photo of sediment basins and containment ponds	Structural approaches use techniques such as sediment basins and containment ponds.
29.	Picture:	Water scene	These devices will delay, block, or trap the pollutants.
30.	Picture:	Composite of nonstructural techniques of controlling pollution	Nonstructural practices include non-physical options such as zoning ordinances, and activity schedules to keep pollutants away from water courses.
31.	Picture:	Large field	Although the most cost-effective BMPs are sought, innovative approaches are encouraged, and often are necessary under certain conditions.
32.	Picture:	Nonpoint source pollution control	Music
33.	Picture:	Stream	Music
34.	Graphic:	Words, Incentives, Regulations, Laws, Agencies, Programs	Many laws, agencies, regulations, and programs already exists for dealing with source pollution.
35.	Graphic:	Nonpoint Source Pollution Planning, Step 5 highlighted	Advisory groups can help identify these opportunities and attempt to coordinate them in order to make your planning effective.
36.	Graphic:	Land use controls	These opportunities include land use controls such as zoning, building codes, subdivision regulations, ordinances, and water and sewer permits.
37.	Picture:	Composite of site inspection and stream monitor	Other methods, especially at the local level, include inspection of construction sites, maintenance schedules, and water quality monitoring.
38.	Graphic:	Interraction between federal and local government	Sometimes, to get the job done, individual municipalities operate together under conservation districts, code enforcement agencies, councils of government, or joint watershed authorities.

39.	Picture: "Nonregulation" supered over agriculture slide	In agriculture, the primary control is through nonregulatory means. Agencies such as the Conservation District, the Agricultural Extension Service, the Soil Conservation Service
40.	Picture: Federal officials	and other agencies offer educational, financial, and technical assistance.
41.	Picture: Agriculture	They can and are being used more effectively in nonpoint source pollution programs. The federal government and many states also operate regulatory programs for nonpoint source pollution.
42.	Picture: "Regulation" supered over composite of mining and silviculture	In contrast to agriculture, nonpoint source pollution from mines and forests is mainly dealt with through regulations. Current trends are towards increased regulations in nearly all sectors.
43.	Picture: Composite of federal agency and local advisory group	However, more regulations may not be necessary. Better use and coordination of existing regulatory programs may suffice. Advisory groups can help sort out the federal, state and local programs that work with nonpoint source pollution.
44.	Graphic: Nonpoint Source Pollution Planning, Step 6 highlighted	Once a plan is formulated, the need for water quality management planning is not over. Situations change. Plans need revisions. Advisory groups can play an important role in ongoing, continuing planning.
45.	Graphic: Advisory group role in continuing planning	Advisory groups can help push plans towards implementation by encouraging cooperation among the various parties. Advisory groups also can monitor and evaluate plans -- making sure that plans are being carried out, and problems are being taken care of.
		Much of the continuing planning for nonpoint source pollution has been accomplished by areawide planning bodies. As federal grants for these activities wind down, the nature and responsibility of ongoing planning is changing. The emphasis is towards applied problem-solving planning, rather than the more comprehensive planning of the past. In the absence of federal monies, advisory groups also can help develop financial self-sufficiency for planning at the local level.

46.	Picture:	Split screen shot of advisory group and NPS planning sequence	An important benefit of this local control is that nonpoint source planning will become a part of the general overall planning process rather than programs with their special grants and organization.
47.	Picture:	Soil erosion	Music
48.	Picture:	Composite of agriculture and silviculture	Music
49.	Picture:	Composite of agriculture, silviculture and advisory group	Although nonpoint source pollution control is complex and difficult, Best Management Practices (BMPs) and implementation means exist for most types of pollution. Through cooperation and coordination in both the planning and implementation, it is possible to prevent and abate nonpoint source pollution.
50.	Picture:	Advisory group member	Advisory groups are in a very special position to facilitate this cooperation and coordination.
51.	Credit slide		Music
52.	Credit slide		Music

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Working for Clean Water is a program designed to help advisory groups improve decision making in water quality planning. It aims at helping people focus on essential issues and questions, by providing trained instructors and materials suitable for persons with non-technical backgrounds. These materials include a citizen handbook on important principles and considerations about topics in water quality planning, an audiovisual presentation, and instructor guide for elaborating points, providing additional information, and engaging in problem-solving exercises.

This program consists of 18 informational units on various aspects of water quality planning:

- Role of Advisory Groups
- Public Participation
- Nonpoint Source Pollution: Agriculture, Forestry, and Mining
- Urban Stormwater Runoff
- Groundwater Contamination
- Facility Planning in the Construction Grants Program
- Municipal Wastewater Processes: Overview
- Municipal Wastewater Processes: Details
- Small Systems
- Innovative and Alternative Technologies
- Industrial Pretreatment
- Land Treatment
- Water Conservation and Reuse
- Multiple Use
- Environmental Assessment
- Cost-Effectiveness Analysis
- Wastewater Facilities Operation and Maintenance
- Financial Management

The units are not designed to make technical experts out of citizens and local officials. Each unit contains essential facts, key questions, advice on how to deal with the issues, and clearly-written technical backgrounds. In short, each unit provides the information that citizen advisors need to better fulfill their role.

This program is available through public participation coordinators at the regional offices of the United States Environmental Protection Agency.